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# NI-9242

# Specifications

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# NI-9242 Specifications

## Definitions

**Warranted** specifications describe the performance of a model under stated operating conditions and are covered by the model warranty.

**Characteristics** describe values that are relevant to the use of the model under stated operating conditions but are not covered by the model warranty.

- **Typical** specifications describe the performance met by a majority of models.
- **Nominal** specifications describe an attribute that is based on design, conformance testing, or supplemental testing.

Specifications are **Typical** unless otherwise noted.

### Related information:

- [Software Support for CompactRIO, CompactDAQ, Single-Board RIO, R Series, and EtherCAT](#)

## Conditions

Specifications are valid for the range -40 °C to 70 °C unless otherwise noted.

## Input Characteristics

Scaling coefficient	59,605 nV/LSB
Number of channels	4 analog input channels
ADC resolution	24 bits

Type of ADC	Delta-Sigma (with analog prefiltering)	
Sampling mode	Simultaneous	
<b>Internal master timebase (<math>f_M</math>)</b>		
Frequency	12.8 MHz	
Accuracy	$\pm 100$ ppm maximum	
<b>Data rate range (<math>f_s</math>) using internal master timebase</b>		
Minimum	1.613 kS/s	
Maximum	50 kS/s	
<b>Data rate range (<math>f_s</math>) using external master timebase</b>		
Minimum	390.625 S/s	
Maximum	51.2 kS/s	
Data rates ( $f_s$ ) <sup>[1]</sup>	$\frac{f_M \div 256}{n}$ , n = 1, 2, ..., 31	
<b>Input voltage range (AIx-to-Ground, Neutral-to-Ground, AIx-to-Neutral)</b>		
Typical	500 Vpk	

Minimum	497 Vpk
Overvoltage withstand	500 Vrms continuous, 600 Vrms for 10 s
Surge withstand	8 kV (1.2 $\mu$ s/50 $\mu$ s)
Input coupling	DC
Input impedance, Alx-to-Ground and Neutral-to-Ground	1 M $\Omega$

**Table 1.** DC and AC Accuracy

Measurement Conditions		Percent of Reading (Gain Error)	Percent of Range (Offset Error) <sup>[2]</sup>
Calibrated	Maximum, (-40 °C to 70 °C)	0.26%	0.14%
	Typical, (23 °C $\pm$ 5 °C)	0.05%	0.022%



**Note** Accuracy specifications are valid for L-L, L-N and L-Earth measurements.

Input noise at 50 kS/s <sup>[3]</sup>	
N-Earth and L-Earth	2.12 mVrms
L-N and L-L	3 mVrms



**Note** When measuring the amplitude of the fundamental frequency over one or several power cycles, the noise of the measurement reduces significantly (theoretically with the square root of the number of samples in the acquisition window).

Nonlinearity (at 25 °C)	20 ppm
<b>Stability</b>	
Gain drift	12.1 ppm/°C
Offset drift	3.4 mV/°C
<b>Post calibration gain match (channel-to-channel, maximum)</b>	
Up to 20 kHz	95 mdB
Up to 10 kHz	44 mdB
Up to 3.8 kHz	30 mdB
Phase mismatch (channel-to-channel)	0.138°/ kHz maximum
Phase mismatch (module-to-module, maximum)	0.138°/kHz + 360° * $f_{in}/f_M$
<b>Phase nonlinearity (<math>f_s = 50</math> kS/s)</b>	
0 kHz to 10 kHz	0.017° maximum

0 kHz to 20 kHz	0.034° maximum
Input delay	40 $\frac{5}{512}$ $/f_s + 1.5 \mu s$
Passband Frequency	$0.453 * f_s$
<b>Flatness</b>	
0 kHz to 20 kHz	±50 mdB maximum
0 kHz to 10 kHz	±20 mdB maximum
<b>Negative phase sequence error at 50 Hz and 60 Hz</b>	
<b>At 5% unbalance</b>	
Maximum	0.21%
Typical	0.09%
<b>At 1% unbalance</b>	
Maximum	0.22%
Typical	0.1%
<b>Zero phase sequence error at 50 Hz and 60 Hz</b>	
<b>At 5% unbalance</b>	

Maximum	0.21%
Typical	0.09%
<b>At 1% unbalance</b>	
Maximum	0.22%
Typical	0.1%
<b>Stopband</b>	
Frequency	$0.547 * f_s$
Rejection	-95 dB
Alias-free bandwidth	$0.453 * f_s$
Anti-alias rejection ( $f_s = 50$ kS/s)	53 dB
-3 dB bandwidth ( $f_s = 50$ kS/s)	$0.49 * f_s$
<b>Crosstalk</b>	
60 Hz	-105 dB
1 kHz	-79 dB



CMRR ( $f_{in} = 60$ Hz)	-75 dB
SFDR (1 kHz, -60 dBFS)	-120 dB
Total Harmonic Distortion (THD), up to 1 kHz	-100 dB

## Power Requirements

<b>Power consumption from chassis</b>	
Active mode	332 mW maximum
Sleep mode	50 $\mu$ W maximum
<b>Thermal dissipation</b>	
Active mode	582 mW maximum
Sleep mode	250 mW maximum

## Physical Characteristics

### Screw-terminal wiring

Gauge	0.2 mm <sup>2</sup> to 3.0 mm <sup>2</sup> (24 AWG to 12 AWG) copper conductor wire
Wire strip length	7 mm (0.28 in.) of insulation stripped from the end

Temperature rating	90 °C minimum
Torque for screw terminals	0.5 N · m to 0.6 N · m (4.4 lb · in. to 5.3 lb · in.)
Wires per screw terminal	One wire per screw terminal
Ferrules	0.25 mm <sup>2</sup> to 2.5 mm <sup>2</sup>
Weight	150 g (5.3 oz)
<b>Connector securement</b>	
Securement type	Screw flanges provided
Torque for screw flanges	0.5 N · m (4.42 lb · in.)

## Safety Voltages

Connect only voltages that are within the following limits:

Maximum working voltage	250 V RMS L-N 400 V RMS L-L
<b>Input voltage range (AIX-to-Ground, Neutral-to-Ground, AIX-to-Neutral)</b>	
Typical	500 V pk

Minimum	497 V pk
Overvoltage withstand	500 V RMS continuous 600 V RMS for 10 s
<b>Maximum working voltage, channel-to earth ground</b>	
Continuous	250 Vrms, Measurement Category III
Withstand	8,000 V pk

## Measurement Category III



**Caution** Do not connect the product to signals or use for measurements within Measurement Category IV.



**Attention** Ne pas connecter le produit à des signaux dans la catégorie de mesure IV et ne pas l'utiliser pour effectuer des mesures dans cette catégorie.

Measurement Category III is for measurements performed in the building installation at the distribution level. This category refers to measurements on hard-wired hardware such as hardware in fixed installations, distribution boards, and circuit breakers. Other examples are wiring, including cables, bus bars, junction boxes, switches, socket outlets in the fixed installation, and stationary motors with permanent connections to fixed installations.

## Environmental Characteristics

Temperature

Operating	-40 °C to 70 °C	
Storage	-40 °C to 85 °C	
<b>Humidity</b>		
Operating	10% RH to 90% RH, noncondensing	
Storage	5% RH to 95% RH, noncondensing	
Ingress protection	IP40	
Pollution Degree	2	
Maximum altitude	5,000 m	
<b>Shock and Vibration</b>		
<b>Operating vibration</b>		
Random	5 g RMS, 10 Hz to 500 Hz	
Sinusoidal	5 g, 10 Hz to 500 Hz	
Operating shock	30 g, 11 ms half sine; 50 g, 3 ms half sine; 18 shocks at 6 orientations	

To meet these shock and vibration specifications, you must panel mount the system.

## Calibration

You can obtain the calibration certificate and information about calibration services for the NI-9242 at [ni.com/calibration](https://ni.com/calibration).

Calibration interval	1 year
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